Article

Opportunities and obstacles to collecting wildlife disease data for public health purposes: Results of a pilot study on Vancouver Island, British Columbia

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Abstract — Existing sources of wildlife morbidity and mortality data were evaluated and 3 pilot active surveillance projects were undertaken to compare and contrast methods for collecting wildlife disease data on Vancouver Island for public health purposes. Few organizations could collect samples for diagnostic evaluation, fewer still maintained records, and none regularly characterized or reported wildlife disease for public health purposes. Wildlife rehabilitation centers encountered the greatest variety of wildlife from the largest geographic area and frequently received submissions from other organizations. Obstacles to participation included the following: permit restrictions; financial disincentives; staff safety; no mandate to collect relevant data; and lack of contact between wildlife and public health agencies. Despite these obstacles, modest investments in personnel allowed novel pathogens of public health concern to be tracked. Targeted surveillance for known pathogens in specific host species, rather than general surveys for unspecified pathogens, was judged to be a more effective and efficient way to provide useful public health data.

Résumé — Possibilités et difficultés de recueillir des données sur les maladies de la faune à des fins de santé publique : résultats d'une étude pilote sur l'île de Vancouver en Colombie-Britannique. Les sources actuelles de données sur la morbidité et la mortalité des animaux de la faune ont été évaluées et 3 projets pilotes de surveillance active ont été entrepris afin de comparer et différencier les méthodes de collection des données des maladies de la faune sur l'île de Vancouver à des fins de santé publique. Peu d'organisations peuvent recueillir des échantillons à des fins diagnostiques, encore moins conservent des dossiers et aucune ne décrit ou rapporte les maladies des animaux de la faune à des fins de santé publique sur une base régulière. Les centres de réhabilitation des animaux de la faune comprennent les plus grandes variétés d'animaux des plus grandes régions géographiques et reçoivent fréquemment des soumissions d'autres organisations. Les obstacles reliés à leur participation comprennent les restrictions de permis, les éléments financiers dissuasifs, la sécurité des employés, l'absence de mandat pour recueillir les données et le manque de contact entres les agences fauniques et celles de la santé publique. En dépit de ces obstacles, de petits investissements au niveau du personnel permettent de suivre un plus grand nombre de pathogènes d'intérêt pour la santé publique. Une surveillance ciblée de pathogènes connus chez des hôtes spécifiques a été jugée plus efficace et efficiente pour fournir des données utiles à la santé publique que les enquêtes générales sur des pathogènes non définis.

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Introduction

Canada faces the challenge of orchestrating public health, livestock health, and wildlife health in a collaborative effort to better predict wildlife zoonotic disease and to guide public health interventions (1). Recent federal plans to develop a Canadian Animal Health Surveillance Network have recognized the potential predictive value of wildlife disease for emerging risks to public health. It has been suggested that routine surveillance of wildlife diseases may help to predict new risks to the public, and allow prevention of, rather than reaction to, diseases such as Lyme borreliosis, *Hantavirus* pulmonary syndrome, and avian influenza (2,3). However, there has been little investigation on how to best collect and integrate wildlife data for ongoing emerging human disease surveillance programs.

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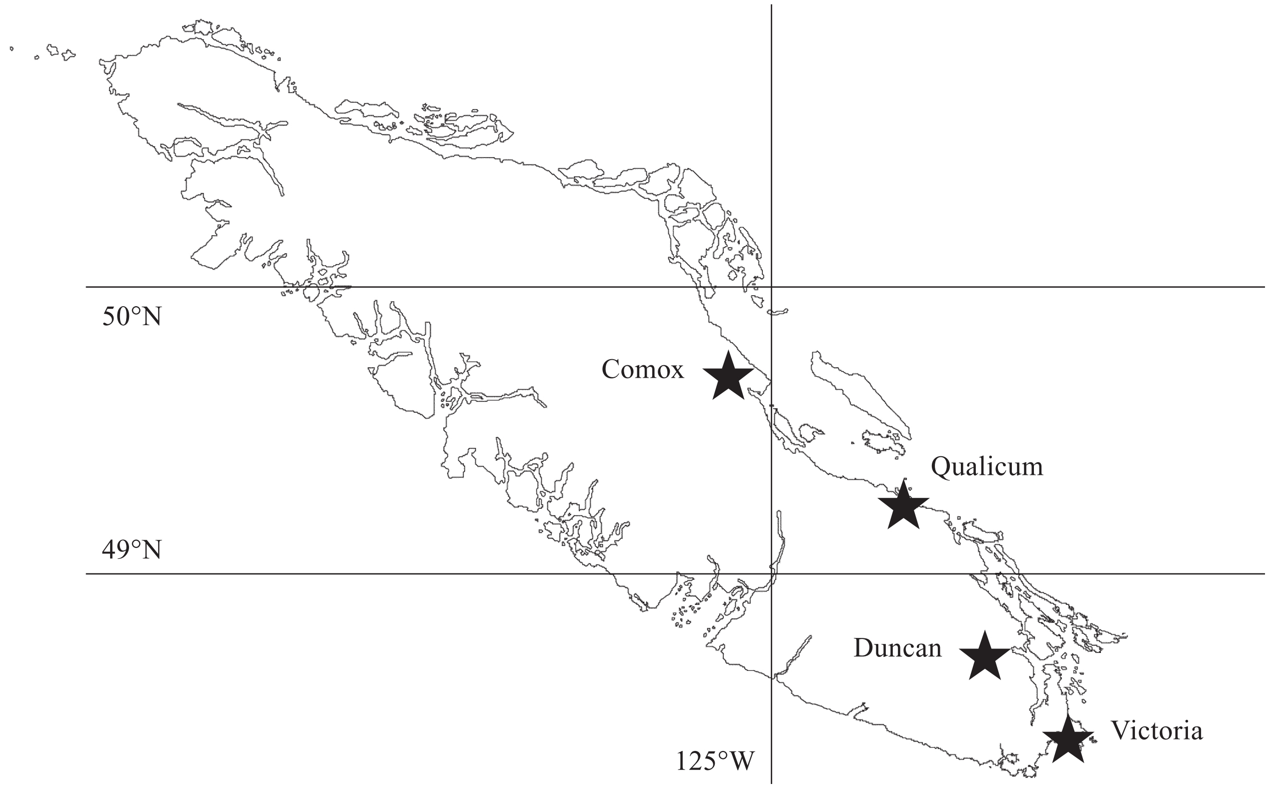

Figure 1. Map of study area on Vancouver Island, British Columbia.

Disease surveillance programs can have 1 of 2 possible orientations: general surveillance that is interested in the occurrence of any disease, or limited surveillance where the focus is on particular, pre-identified diseases (4). Although currently no systematic wildlife disease surveillance program exists in British Columbia (BC), targeted live sampling and opportunistic sampling of dead animals is periodically carried out by the provincial wildlife agency, domestic animal health agencies, veterinary organizations, and government or academically affiliated wildlife interest groups (2,4). These data are of variable quality but are used for wildlife health and disease risk assessments and evaluations. However, the efficiency and effectiveness of using opportunistic collection of wildlife disease data for public health purposes remains unclear. Recent projects, such as the use of corvids for forecasting human exposure risk to *West Nile virus (WNv)* or tracking deer mouse populations to predict increasing risk of human exposure to hantaviruses, suggest that paying attention to wildlife has public health utility (5,6). However, such projects typically require considerable special effort and additional resources rather than utilizing preexisting wildlife data collected for other purposes. This paper reports the results of a pilot study conducted on Vancouver Island, BC, to examine the opportunities and obstacles to collecting and evaluating wildlife disease data for public health surveillance purposes, by inventorying existing sources of data and evaluating 3 approaches to collecting data on the causes of morbidity and mortality in wildlife.

Materials and methods

An initial list of wildlife-orientated organizations on southern Vancouver Island was created through interviews with provincial government staff, Internet searches, and a search of the yellow page listings in the Nanaimo and Victoria telephone directories. In 2004, the survey focused largely on veterinary services and wildlife rehabilitation facilities in and around Victoria on the southern tip of Vancouver Island (Figure 1). The following year, the focus was expanded to include the geographic area from Victoria to Comox, with a greater emphasis on including organizations that handle or observe wildlife but do not necessarily provide medical care for those animals (taxidermists, ecotourism businesses, highway contractors). A standardized questionnaire was developed to evaluate the willingness and ability of these organizations to participate in a wildlife disease surveillance program, to determine the distribution and diversity of animals that they encounter (encounter was defined as the ability to find and collect dead wildlife, or to collect biological samples from living wildlife), to assess the quality of available records and carcasses for a surveillance program, and to identify and quantify the primary reasons that would hinder participation by these organizations. The survey was conducted via telephone, facsimile, e-mail, or in-person interviews, depending on the availability of the participants.

Two approaches to general surveillance of wildlife illness and death were assessed. First, the organizations that handle ill, injured, orphaned, or dead wildlife were asked if they maintained a log of wildlife admissions, how long those records were kept, and how they were stored. These organizations were then asked if they would share their records for disease surveillance purposes. The 3 largest wildlife rehabilitation centers on southeastern Vancouver Island and Salt Spring Island provided their log books for May and June of 2004. We quantified the levels of completeness, timeliness of data entry, and the legibility and interpretability of those records with respect to species, date and location found, age of the animal, and diagnosed cause of illness or death.

Second, transects at a public beach, an urban park, and a heavily forested park on southern Vancouver Island were monitored twice weekly for 4 mo in 2004. Human-animal interactions, general animal health, and the frequency with which animal carcasses, feces, or both, could be observed were recorded and evaluated. A standard observation area of approximately 5 m to either side of the path and a standard walking time of 45 min was used to account for the differences in the terrain of the transect areas. Animals seen in trees or in the air were included in the recorded observations.

Limited surveillance in collaboration with investigators tracking specific wildlife diseases of public health interest on southern Vancouver Island was undertaken in 2005 with the objective of assessing if biological materials of sufficient diagnostic quality and quantity could be provided to support the efforts of our collaborators. From May to July, wildlife carcasses were collected from the provincial Ministry of Environment (MOE), 3 wildlife rehabilitation facilities, a local trapper, and 1 veterinary clinic actively involved with wildlife. Whole carcasses from a variety of taxa, species, and ages were collected, along with information on the location found and the date of death. Tongue, brain, heart, lung, and skeletal muscle tissue samples collected from these carcasses were submitted to collaborators for polymerase chain reaction (PCR) analysis for *Toxoplasma gondii* and *Sarcocystis neurona.* Nasal, rectal/cloacal, cranial cerebral spinal fluid, and surface lung swabs were collected for the culture of *Cryptococcus gattii.* Blood serum samples were collected from grey squirrels for a *Parapoxvirus* study, and tissue samples from sea mammals were formalin-fixed in 10% buffered formalin for a study on *Giardia* and *Cryptosporidium.* Notes were kept as to the quality of the carcass and the cause of death, based on gross observation. Collaborators were subsequently interviewed to assess the diagnostic quality of the samples submitted.

In the summer of 2005, the Centre for Coastal Health (CCH) participated in BC's *West Nile virus* surveillance program. We requested and received data from the corvids collected and submitted to the BC Animal Health Centre (Ministry of Agriculture and Lands) for WNv testing (VecTest; Medical Analysis Systems, Camarillo, California, USA) to compare against the limited surveillance project described previously. Whereas the other programs described previously relied on a single person to find and retrieve carcasses, the WNv program employed 3 full-time staff who responded to calls from the general public on an advertised toll-free number. Date of death and location found, as well as the status and quality of the carcasses, were recorded.

Results

Local public health and veterinary public health practitioners recognized the potential role for wildlife health information as a means to predict disease risks and forewarn the medical community and public about the need to minimize risks to human health. However, they did not want to receive raw data that had not first been evaluated from a public health perspective.

A total of 218 organizations in the federal, provincial, and municipal levels of government, as well as a number of independent and private organizations, were contacted. Independent organizations included veterinarians, trappers, taxidermists, ecotourism businesses, pest control companies, public works and highways maintenance staff, and local naturalists, among others. Only 30% (30/100) of the organizations surveyed in 2004 kept records of the wild animals they encountered. Of those 30, the majority (80%) kept handwritten records; nine of the 30 (30%) used computerized methods, and 4/30 (13%) had searchable database records, in addition to their handwritten records. Eleven percent of the organizations reported their test results to institutions such as MOE, Environment Canada, the Department of Fisheries and Oceans, the BC Centre for Disease Control, Health Canada, provincial and federal diagnostic laboratories, and members of the public exposed to zoonotic disease. Records were kept anywhere from 1 wk to indefinitely, depending on the organization.

Wildlife rehabilitation centers, veterinary clinics, municipal and provincial environmental departments, municipal public works, road maintenance crews, animal control groups, public health units, universities, and trappers regularly encountered wildlife. Of these groups, wildlife rehabilitation centers encountered the largest number of animals from the greatest variety of wildlife taxa over the widest geographic catchment area. Although wildlife rehabilitation organizations were willing to share their data, the quality of the records varied considerably. As these records were handwritten, some entries were very difficult to read. Timeliness of data entry and interpretability were reasonable. Initial entries with preliminary information were made when an animal was first admitted to the facility. Common abbreviations were used between all 3 organizations to describe the species affected and its presenting complaint, such as HBC for "hit by car" and GBHE for "great blue heron," which made for easy comparison of the data. However, the variety and completeness of information and data legibility were less consistent and reliable. Information on species, age, sex, and location found, as well as suspected cause and characterization of the animal's clinical signs and status were inconsistently recorded. The primary cause of the animal's debilitated state was frequently recorded as an incident, such as "orphaned" or "caught by cat," as opposed to the underlying clinical, etiological, or pathological diagnosis. The disease status of an animal was often unknown and rarely supported with diagnostic evidence. Animals or samples were infrequently sent to a veterinary diagnostic laboratory for clinical or postmortem diagnosis. The general health of all animals was assessed by gross observation, most commonly by an in-house trained volunteer animal care giver rather than a licensed veterinarian or a certified wildlife rehabilitator. On-site ancillary diagnostic tests, such as fecal floatation, hematologic, clinical blood chemical analysis, or gross postmortem examinations were very rarely performed.

Samples generated by the provincial wildlife veterinarian were most often supported by a clinical or pathological diagnosis. However, only a relatively small number of animals from

Table 1. A comparison of the most common species encountered through active collection of carcasses from collaborating organizations (active surveillance) and through transect observations (passive surveillance, broken down to indicate species differences between the most commonly seen living and dead animals)

Common name	Species	Active surveillance (n = 265)	Passive surveillance (alive and dead) (n = 153)	Passive surveillance (dead) (n = 16)
Grey squirrel	*Sciurus carolinensis*	26%	0%	0%
American robin	*Turdus migratorius*	9%	0%	0%
Eastern cottontail	*Sylvilagus floridanus*	8%	0%	6%
Black-tailed deer	*Odocoileus hemionus*	6%	0%	6%
European starling	*Sturnus vulgaris*	5%	0%	0%
Northern flicker	*Colaptes auratus*	5%	0%	0%
Gull	*Larus* sp.	5%	8%	12%
Raccoon	*Procyon lotor*	4%	0%	0%
Pine Siskin	*Carduelis pinus*	3%	0%	0%
Great blue heron	*Ardea herodias*	2%	7%	50%
Northwestern crow	*Corvus caurinus*	0%	26%	0%
Mallard duck	*Anas platyrhynchos*	0%	11%	6%
Swallow	*Tachycineta bicolor*	0%	7%	0%
Bushtit	*Psaltriparus minimus*	0%	3%	0%
House sparrow	*Passer domesticus*	0%	3%	0%
Harbour seal	*Phoca vitulina*	0%	0%	19%
Unidentifiable		0%	0%	16%

Vancouver Island were examined by the provincial veterinarian for general surveillance purposes. Cases were often associated with nuisance animal investigations, examination of edible portions of animals of concern to hunters, or in response to observed clusters or unusual deaths in wildlife. The provincial wildlife veterinarian played a critical role in wildlife surveillance for public health projects by helping other investigators access specimens or animals for diagnostic, research, or risk assessment purposes.

The noncompliance rate for the 2004 and 2005 surveys was 23.4% (51/218). Noncompliance was largely a result of unreturned phone calls or a lack of time or interest on the interviewee's part. Of the compliant respondents, 52.7% (88/167) said they found and collected dead wildlife, or could collect biological samples, such as hair, blood or feces, from living wildlife. Forty-seven percent (79/167) said they could not collect deceased wildlife or biological samples. Of the organizations that encountered wildlife in the 2005 survey, 37 (82.2%) encountered animals through incidental or unexpected findings, 30 (66.7%) encountered wild animals by assisting concerned members of the public, and 19 (42.2%) referred wildlife to MOE or to wildlife rehabilitation centers. It was in the job description or mandate of 34 (75.6%) of the organizations to actively care for or handle ill or deceased wildlife. Thirteen (28.9%) organizations stated that carcasses were often left in-situ to decompose naturally in the environment. This occurred most often when dealing with large carcasses, such as marine mammals and bears. Carcasses also had many other uses, including provision to First Nations for cultural or ceremonial purposes, recovery of hides, and reuse as bait for traps.

Seventy-three percent (56/77) of the veterinary clinics interviewed had very limited involvement with wildlife. These small and mixed animal practices tended to redirect public phone calls to local wildlife rehabilitators, or triaged animals brought to them until they could be transported to a wildlife rehabilitation center as they did not hold a permit to care for wildlife. Thirteen percent (10/77) of the veterinary clinics provided veterinary care and diagnostic services to a wildlife rehabilitation center.

Most individuals and organizations interviewed encountered wildlife year-round, although the season with the highest wildlife encounter rates was variable and dependent on the nature of the organization. Hunters, trappers, and taxidermists, for instance, tended to encounter most wildlife in the fall and winter seasons, whereas wildlife rescue societies and road contractors encountered most wildlife in the spring and summer seasons.

Only 14% (14/100) of the organizations contacted in 2004 were interested in participating in a disease surveillance system. The remaining respondents provided the following reasons for not being interested, able, or willing to participate: limited funding, staff time, and manpower; lack of interest; insufficient animal numbers; concern for animal welfare; and concern with whom information might be shared. The 2005 survey had similar findings, with the primary reasons against participation being financial costs, no training and education for employees, and a lack of equipment and facilities for the collection of specimens or the transport of carcasses. Legal issues and permit requirements, as well as consultation and collaboration, were factors that some organizations thought might hinder participation in wildlife disease surveillance.

Twenty-five dead animals were sighted throughout the entire transect study (17.93 h of transect time), an estimated catch per unit effort of only 1.39 sightings/h. These carcasses tended to be badly decomposed or scavenged. People were seen in the vicinity of a carcass when walking or picnicking, but no direct contact between people and the dead animals or animal wastes was observed.

Of the 265 carcasses that were collected as part of the limited surveillance for selected pathogens, 2.3% (6/265) were carnivores, 3.8% (10/265) omnivores, 6.0% (16/265) ungulates, and 1.9% (5/265) aquatic mammals. Rodents and lagomorphs comprised 26.0% and 7.9% (69 and 21/265, respectively), although the high rodent numbers were influenced by a targeted Grey squirrel parapoxvirus study. Bird species accounted for 52.1% (138/265) of the carcasses collected for this study, with 7.5% (20/265) raptors, 13.6% (36/265) aquatic birds, 26.0% (69/265) passerine birds, and 4.9% (13/265) other terrestrial species. The scope of species available for collection was congruent with the questionnaire results in regards to the most commonly encountered species. Some species (in particular rats, mice, and marine mammals) were rarely found, despite the fact that they are commonly on and around Vancouver Island. The species most commonly encountered on Vancouver Island by our different collection methods are compared in Table 1.

Male and female carcasses from adult, juvenile, and nestling age groups (the proportions of which varied among species) were obtained predominately from 2 of the 3 wildlife rehabilitation facilities (51% of 265) and from MOE in Victoria (15% of 265). Other organizations that provided carcasses included a third wildlife rehabilitation facility, an independent hunter/trapper, a city pound, and a veterinary clinic in Nanaimo. Three noncorvid passerines were submitted by the staff of the Vancouver Island WNv surveillance project. Carcasses were collected from all over Vancouver Island, although 48.7% (129/265) of these specimens had been found in the area between Duncan and Victoria. This geographic area corresponds roughly to the region of Vancouver Island with the highest human population. Seventy-one (26.8%) of the 265 carcasses were found on Central Vancouver Island, in the area between Qualicum and Duncan. The remaining 24.2% (64/265) of specimens were from North Vancouver Island (north of Qualicum). Samples from a single cougar from Vernon, BC, were accepted into the project specifically for *T. gondii* sampling.

On average, it took 49 d (average deviation of 28.7 d) from the date a carcass was found by the public to the date of necropsy. All the carcasses had been frozen prior to sampling, affecting their suitability for reliable histopathologic examination. Nevertheless, our collaborators reported that the submitted samples were of sufficient diagnostic quality to confirm findings of *T. gondii* and *S. neurona* by PCR and to recover *C. gattii* by culture.

The WNv surveillance staff received 217 calls from the public on Vancouver Island between May 10 and August 5, 2005. Two hundred of these calls were for deceased Corvidae (crows and ravens); the remaining 17 were for small passerines, such as starlings, American robins, and finches. One hundred and forty-two (71.0%) of the 200 corvids were suitable for WNv testing and were subsequently submitted to the BC Animal Health Centre. The remaining 58 (29.0%) corvids were unsuitable for testing for the following reasons: the carcass was in an advanced state of decomposition (44.8%); the carcass could not be found at the described location (18.9%); a member of the public disposed of the carcass before it could be retrieved for testing (1.7%); the carcass was decapitated (3.5%); or the bird had died due to drowning (1.7%). For 7 of the 58 (12.1%) carcasses, no reason was given to indicate why they were unsuitable for diagnosis.

Discussion

The most significant obstacle for collection and use of wildlife disease data for public health purposes was the lack of a program with the mandate to observe, interpret, and report wildlife disease patterns for public health agencies. The one exception in this study area was the provincial wildlife veterinarian. Improvements in communication, data collection, and information management would be needed before wildlife health data could be used routinely by public health agencies on Vancouver Island.

Although wildlife rehabilitation centers were willing and able to share their records, there was generally insufficient information to detect trends in zoonotic diseases due often to incomplete and not diagnostically oriented records. The reliance on volunteers without training in pathology can result in significant misclassification of cause of death, as previously shown for beached seabirds (7). The availability, completeness, and accessibility of records were low for most other organizations that encounter wildlife. Few organizations maintained long-term records and fewer were willing or able to share records. Organizations that were willing to share their data were already submitting them to provincial and national organizations, but their records were often stored without analysis. In addition, handwritten records had limited legibility and transferability. Existing wildlife disease records often lacked an etiological or pathological diagnosis. The exception was samples obtained by the provincial wildlife veterinarian, usually supplied by MOE staff or the public. Our results suggest that reliance on other agencies to generate data useful for the early detection of emerging zoonoses would currently be of limited value in the study area. Understanding and supporting the role of provincial diagnostic laboratories in routine wildlife surveillance should be encouraged.

The likelihood of observing sick or dead wildlife during transects was very low and required significant investment of time. The carcasses found were decomposed to the point where diagnostic tests could not be conducted. Based on the observed human-animal interactions, the possibility for horizontal disease transmission was also low. Finding sufficient numbers of fresh carcasses in their environment for diagnostic purposes would require large numbers of trained individuals (trappers, conservation officers, biologists, and veterinarians) to collect field samples, supported by pathologists and diagnosticians who are willing and have the time and financial resources to process the carcasses. Such programs have existed in BC in the past and some are currently in place, but they are often of limited duration and target specific species or etiologic agents. Maintaining ongoing general surveillance would likely exhaust collaborative efforts and available resources and would be difficult to justify, given the low yield of animals and diagnostic material made available by actively searching for dead or ill wildlife. Therefore, general surveillance will likely be restricted to opportunistic collection of animals rather than a systematic and sustainable surveillance program.

Many of the carcasses found by other organizations or individuals were either scavenged, autolyzed, or decomposed. The exception was wildlife rehabilitation centers and, to a lesser extent, representatives of the MOE, where animals were immediately frozen after death. Although this reduced their value for histological diagnosis, they could still be used for microbiological surveys. Results from the combined *T. gondii, C. gattii,* and *S. neurona* study on Vancouver Island showed that it was possible to collect samples from a diversity of taxa across a number of ecological niches for a targeted active disease surveillance program. The timeliness of laboratory results for this study was delayed, due to the time each carcass spent in freezer storage or in transit between organizations. Many of the organizations we surveyed encounter a similar distribution of species and currently refer or submit animals or samples to wildlife rehabilitators or the MOE. As a result, the wildlife rehabilitation facilities and the MOE had the largest number and diversity of species (because they were both a collection point for carcasses from a variety of sources and their own collector of carcasses) and were the most willing and able to provide carcasses for our study. A wildlife disease surveillance program on Vancouver Island, therefore, will rely primarily on carcasses supplied by wildlife rehabilitation facilities and the MOE. Nonetheless, exclusive use of rehabilitation facilities and the MOE would restrict the variety of species examined, as small passerines, black-tailed deer, raccoons, and eastern cottontails dominated their submissions. Additional sources of carcasses may have to be sought, depending on the pathogen of concern and its host (pest control companies for surveillance in rodents), or depending on the seasons when high numbers of a particular species could be collected (bear in the fall hunting season). Mice, rats, and bats (*Myotis* spp.), though common on Vancouver Island, were underrepresented in this project. This is likely an important deficit given the historical importance of rodents and bats for emerging and reemerging zoonotic diseases, such as Lyme disease, cryptosporidiosis, toxoplasmosis, and rabies, on Vancouver Island (8–11). The lack of small rodents and bats can be explained by a number of factors, including their small size, which complicates detection in the wild; the lack of wildlife status for rats and mice; and regional rabies concerns that limit examination of bats. Hunters and trappers on Vancouver Island could be an invaluable future resource, as exemplified by their collaboration with the MOE, the Canadian Wildlife Service, and the BC Centre for Disease Control on a number of recent projects, including toxicological and parasitology studies (12,13). Samples provided by hunters and trappers are, however, limited to a small variety of economically important mammals that are sought in the fall and winter seasons. To make use of animals too large to remove from field locations, training programs could be implemented and the equipment made available for field personnel to properly collect the tissues and organs; however, the staff time required would likely be a limiting factor.

Our results agree with the views of Leighton et al (4) that field personnel, including biologists, conservation officers, park wardens, naturalists, and fisheries officers, play a key role in wildlife disease detection. The value of public participation in wildlife disease surveillance was highlighted by its role in submission of animals to wildlife rehabilitation centers and in targeted projects, such as WNv surveillance. Training to facilitate observation, reporting, and submission of unusual mortalities and surveillance data (4) would likely improve zoonotic disease detection. Nevertheless, there must be an agency with the mandate to receive, assess, and disseminate the reported information. There was no single program that intended to regularly collect the full spectrum of wildlife diagnostic data and assess it for public health purposes. This responsibility was disseminated among groups and tended to be called upon on as an issue-by-issue basis, rather than as an assigned ongoing responsibility.

We identified a number of factors that could limit the involvement of wildlife organizations in disease surveillance systems. Financial cost was the most common concern and increased as individuals were asked to devote more of their personal time and resources. Education and training of employees was also a potential limiting factor, especially if staff were required to handle potentially infectious carcasses. Many public and private sector organizations recommended some financial incentive. Leighton et al (4) suggested that education could increase compliance, as personnel would better understand the importance of their contributions.

One issue not previously discussed in the literature, but instrumental for participation in a surveillance program, is permit regulations. In BC, individuals and organizations can apply for permits that allow them to possess dead wildlife or wildlife parts, but these same permits do not allow the buying, trading, selling, or giving away of wildlife or wildlife parts. The transfer of the right of property from the permitting body, to the permit holder, to the person wishing to examine the carcass, requires specialized permits. Carcasses cannot be removed from provincial parks without special permits, and additional federal permits may be required for some species. Future surveillance programs should develop agreements with permitting agencies to collect and transfer samples in a manner that does not compromise the agencies and individuals providing the samples.

Different methods for acquiring samples can result in different numbers and diversity of animals collected. For example, our efforts, using one employee to seek out samples for *T. gondii, S. neuronam,* and *C. gattii* investigations, yielded twice the number of carcasses for testing as the WNv project, which used 3 employees (265 carcasses from a diverse taxonomic spectrum compared to 142 corvids). A modest investment in labor can create gains in the number, diversity, and range of samples collected when a surveillance program works collaboratively with organizations that already collect wildlife, especially wildlife rehabilitation centers. Reliance on wildlife rehabilitation centers does limit the diversity of species found, but it will increase the likelihood of obtaining samples from animals more likely to be living near populated areas.

This project has demonstrated that with modest additional effort, a system could be developed that would provide samples suitable for diagnostic purposes on an ongoing basis for surveillance of wildlife pathogens of public health concern. Wildlife surveillance for public health purposes should be strategically designed to target specific pathogens of concern in specific high risk situations. It is more effective to track the spread of a known agent within wildlife populations than to “mine” submissions for evidence of a previously unknown zoonotic pathogen.

ARTICLE

The principle obstacles to ongoing wildlife disease surveillance system for public health purposes included a lack of mandate for some agencies to collect or generate pathological or etiological data from wildlife, a lack of regular contact for sharing of information between wildlife agencies and public health officials, and a lack of resources to collect, integrate, and interpret wildlife information for public health purposes. The public's focus on certain wildlife (such as hunted or charismatic species) meant that a number of important zoonotic disease reservoirs, such as rodents and bats, were not included in ongoing surveillance. We conclude that, given the current opportunities and obstacles, surveillance that targets for known or suspected risks in specific host species would be a more effective and efficient way to gather useful public health data than general surveys for unspecified etiological agents in a wide variety of opportunistically collected wildlife.

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The funny file — Ça dilate la rate!

A dog thinks: Hey, these people I live with feed me, love me, provide me with a nice warm dry house, pet me, and take good care of me... They must be Gods!

A cat thinks: Hey, these people I live with feed me, love me, provide me with a nice warm dry house, pet me, and take good care of me... I must be a God!

Un chien pense : Eh bien, ces personnes avec qui je vis me donnent à manger, m'aiment, me donnent un abri chaud et sec, me flattent et prennent bien soin de moi... Ils doivent être des Dieux!

Un chat pense : Eh bien, ces personnes avec qui je vis me donnent à manger, m'aiment, me donnent un abri chaud et sec, me flattent et prennent bien soin de moi... Je dois être un Dieu!